NASA SBIR/STTR Technologies

S1.04-8232 - Large-Area, Solid-State Photomultiplier for Ultraviolet Detection

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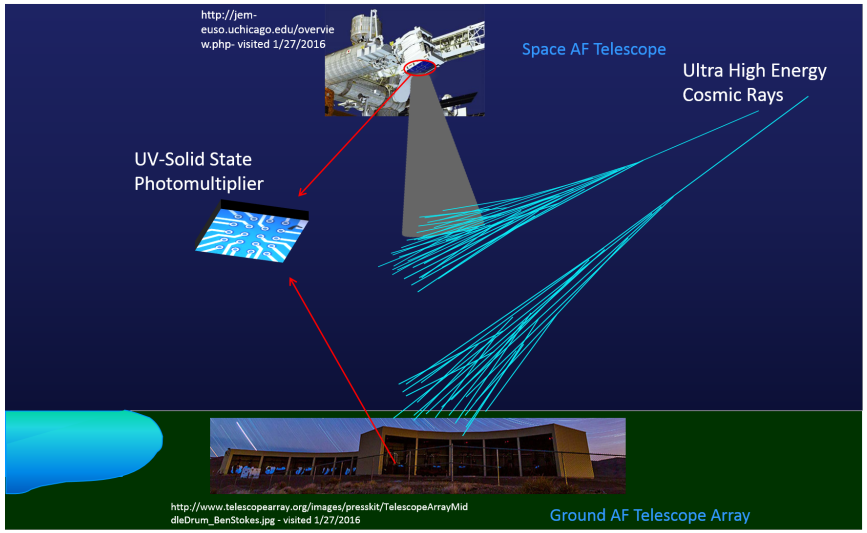
Identification and Significance of Innovation

Understanding the fundamental physics of cosmic rays may help elucidate basic properties of the universe. However, after more than 100 years, the source of these particles remains elusive. New detector technology and detection concepts based on UV fluorescence detection promise to dramatically increase our ability to study these particles. To detect air fluorescence generated from cosmic rays with energies exceeding 1019 eV, which are rare events that produce small light flashes at the detector, a high UV (300-400 nm) sensitivity, single-photon large-are detector is needed.

Radiation Monitoring Devices, Inc. (RMD), propose to design and develop large-area solid-state photomultipliers (SSPMs) based on wide band-gap materials. Proposed WBG SSPMs will have high gain (105-106), low noise (100 times lower than similar size Si based device), fast response (<5ns), high detection efficiency (>50%) and sensitivity to a single photoelectron at wavelengths between 300 and 400 nm.



Estimated TRL at beginning and end of contract: (Begin: 3 End: 4)

Technical Objectives and Work Plan

1. Enhance the detection performance of existing AlGaAs GPDs down to 300 nm

2. Improve the noise performance of the GPDs

3. Develop a GPD array to demonstrate SSPM behavior

NASA Applications

- Cosmic ray studies
- Cherenkov telescopes to study high energy gamma rays
- Low noise, high gain, single photon detectors of dark matter searches
- Single photon UV detectors for scintillation based gamma/neutron detectors
- Spectrometers for planetary science.

Non-NASA Applications

Radiation dosimetry
- Cherenkov detectors for high energy physics
- Gamma/neutron spectroscopy
- Medical imaging such as PET and SPECT
- Portal monitors for nuclear material identification
- Radiation detectors for oil logging

Firm Contacts

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